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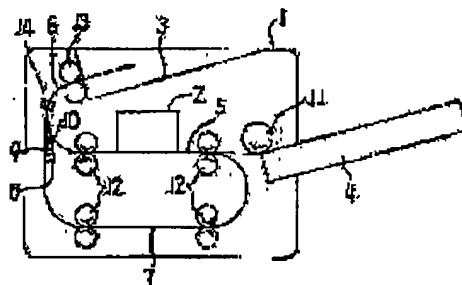
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(54) PERFECTING PRESS

(57)Abstract:

PURPOSE: To obtain a perfecting press which can be reduced in installation space and paper feed path with the smaller number of paper feed rollers, feed direction change-over plates, and the like.

CONSTITUTION: Paper printed on one surface thereof is discharged on a discharged paper receiver 3, which is provided on the upper surface of a body 1, through a first reversing path 6. By reversely rotating a paper supply/ discharge means 13, the paper on the discharged paper receiver 3 is returned onto the first reversing path 6. Furthermore, the paper is led onto a second reversing path 7 by a feed direction change-over plate 9 to be again supplied to the upstream of a paper feed path 5. The paper is printed on the other surface thereof. The perfected paper is discharged on the discharged paper receiver 3 through the first reversing path 6 by again rotating the paper supply/discharge means 13 forward. In addition, the discharged paper receiver 3 formed by using the upper surface of the body 1 also serves as a switchback path.



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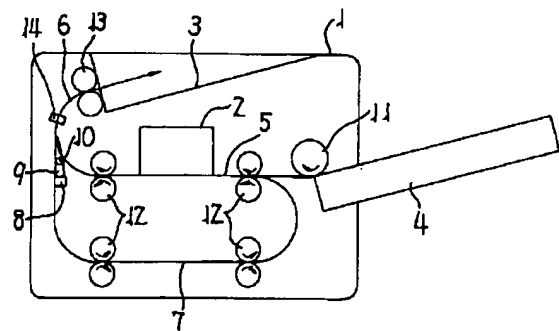
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(54)【発明の名称】 両面印字装置

(57)【要約】

【目的】 設置スペースを縮小し、用紙の搬送経路を少なくして用紙を搬送するローラ類や搬送方向切替板等の数を少なくし得る両面印字装置を提供する。

【構成】 一面に印字された用紙を第一の反転通路6を介して本体1の上面の排紙受け3に排紙し、給排紙手段13を逆転させることにより排紙受け3の用紙を第一の反転経路6に戻し、さらに、搬送方向切替板9により第二の反転通路7に導いて再度用紙搬送通路5の上流側に供給して用紙の反対側の面に印字し、再び給排紙手段13を正転させることにより、両面印字された用紙を第一の反転通路6を介して排紙受け3に排紙する。また、本体1の上面を利用して形成した排紙受け3をスイッチバック通路として利用する。



【特許請求の範囲】

【請求項1】 印字部が内蔵され上面に排紙受けが形成された本体と、給紙部に接続されて前記印字部を通過する用紙搬送通路と、この用紙搬送通路の下流側から前記排紙受けに向けて上方に湾曲された第一の反転通路と、この第一の反転通路の途中から下方に向けて接線方向に分岐され前記印字部の下を通り上方に向けて湾曲され前記用紙搬送通路の上流側に合流された第二の反転通路と、前記第一の反転通路と前記第二の反転通路との分岐路に回動自在に設けられた搬送方向切替板と、前記用紙搬送通路及び前記第二の反転通路に配設された用紙搬送手段と、前記第一の反転通路における前記排紙受けと前記搬送方向切替板との間に設けられた正逆回転自在の給排紙手段とよりなることを特徴とする両面印字装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、両面印字装置に関する。

【0002】

【従来の技術】従来、図4に示すように、印字装置の本体20の底部に設けられた給紙カセット4内の用紙を給紙ローラ11により用紙搬送通路5に送り出し、その用紙を用紙搬送ローラ12により印字部2に供給し、一面に印字がなされた用紙を本体20の側面に設けた排紙トレイ21に向けて給排紙ローラ13により排出し、続いて、印字部2から排紙トレイ21に向かう用紙の後端をセンサ14が検出した時に、給排紙ローラ13を逆転させ、搬送方向切替板23により用紙を印字部2の上方を通る反転通路22を介して用紙搬送通路5の上流側に導き、用紙搬送ローラ12により用紙を再度印字部2に送り、印字された用紙を排紙トレイ21に向けて搬送するようにした両面印字装置がある。なお、搬送方向切替板23は自重により用紙搬送通路5を閉塞する状態に維持されて排紙トレイ21から反転通路22に用紙を導くものであるが、印字部2から排紙トレイ21に向かう用紙の圧力により上方に回動して用紙搬送通路5を開放するものである。

【0003】また、従来の他の例を図5ないし図7に基づいて説明する。ここで、図4において説明した部分と同一構造の部分は同一符号を用いて説明する。図5及び図6に示す例では、図5に示すように、印字装置の本体20の側面に装着した給紙カセット4内の用紙を給紙ローラ11により用紙搬送通路5に送り出し、その用紙を用紙搬送ローラ12により印字部2に供給し、一面に印字がなされた用紙を搬送方向切替板24により本体20の上面の排紙受け3に導いて排紙ローラ25により排出し、両面印字に際しては、図6に示すように、ソレノイド26により搬送方向切替板24を回動させ、この搬送方向切替板24により印字部2から送られた用紙を下方に湾曲する反転通路27に導き、この反転通路27に導

かれた用紙を用紙搬送ローラ12と給排紙ローラ13とによりスイッチバック通路28に導き、用紙の端部をセンサ14が検出した時に、給排紙ローラ13を逆転させることにより、用紙を搬送方向切替板23により用紙搬送通路5の上流側に導き、印字部2により用紙の裏面に印字し、ソレノイド26の復帰動作で下向きに回動された搬送方向切替板24により印字された用紙を上部の排紙受け3に排紙するようにした両面印字装置がある。なお、この例においては、搬送方向切替板23は自重により回動してスイッチバック通路28の用紙を用紙搬送通路5の上流に導く状態に維持されるが、反転通路27からスイッチバック通路28に向かう用紙の圧力により上方に回動して用紙の通過を許容するものである。

【0004】図7に示す例では、片面印字に際しては、印字装置の本体20の底部に設けられた給紙カセット4内の用紙を給紙ローラ11により用紙搬送通路5に送り出し、その用紙を用紙搬送ローラ12により印字部2に供給し、一面に印字がなされた用紙を搬送方向切替板29により案内しながら排紙ローラ25により本体20の側面の排紙トレイ21に排出し、両面印字に際しては、印字部2から送られる用紙を搬送方向切替板29により印字部2の上方を通る反転通路30に導き、この反転通路30に導かれた用紙を用紙搬送ローラ12によりスイッチバック通路28に送り、用紙の後端をセンサ14が検出した時に、給排紙ローラ13を逆転させ、搬送方向切替板9により用紙を用紙搬送通路5の上流側に導き、用紙を再度印字部2を通して排紙トレイ21に向けて搬送する過程で用紙の裏面に印字するようにした両面印字装置がある。この例において、一方の搬送方向切替板29はソレノイドにより駆動される。他方の搬送方向切替板9は錘8により支軸10を中心に反時計方向に回動して図示しないストッパに当接して静止し、これにより、スイッチバック通路28の用紙を用紙搬送通路5に案内する状態に維持されるが、反転通路30からスイッチバック通路28に向かう用紙の圧力により水平方向に回動して用紙の通過を許容するものである。

【0005】

【発明が解決しようとする課題】図4に示すものは、両面印字に際して、印字された用紙を反転経路22に戻すために本体20の側面に排紙トレイ21を設けなければならない。また、図5及び図6に示すものは、印字された用紙を反転経路27に戻すために本体20の側面にスイッチバック通路28を設けなければならない。同様に、図7に示すものは、印字された用紙を用紙搬送通路5の上流側に戻すために、本体20の一侧にスイッチバック通路28を設け、しかも、本体20の他側にも排紙トレイ21を設けなければならないので、本体20の設置スペースがさらに広がる。また、図5ないし図7に示すように、排紙受け3や排紙トレイ21とは

別にスイッチバック通路28を設けた場合には、それだけ用紙の搬送経路が複雑化するため、用紙を搬送するローラ類や搬送方向切替板の数が増加し、コストが高くなる問題がある。さらに、図示しないが、両面印字のために用紙を反転させて格納する中間トレイを印字装置の本体の内部に設けたものがあるが、この中間トレイは印字直後の用紙を格納するために汚れ易く、本体の内部に存在するだけに清掃も煩わしい。

【0006】

【課題を解決するための手段】本発明は、印字部が内蔵され上面に排紙受けが形成された本体と、給紙部に接続されて前記印字部を通過する用紙搬送通路と、この用紙搬送通路の下流側から前記排紙受けに向けて上方に湾曲された第一の反転通路と、この第一の反転通路の途中から下方に向けて接線方向に分岐され前記印字部の下を通り上方に向けて湾曲され前記用紙搬送通路の上流側に合流された第二の反転通路と、前記第一の反転通路と前記第二の反転通路との分岐路に回転自在に設けられた搬送方向切替板と、前記用紙搬送通路及び前記第二の反転通路に配設された用紙搬送手段と、前記第一の反転通路における前記排紙受けと前記搬送方向切替板との間に設けられた正逆回転自在の給排紙手段とにより構成した。

【0007】

【作用】給紙部から用紙搬送通路を介して印字部に用紙を供給し、印字された用紙を第一の反転通路を通して搬送方向切替板により本体の上面の排紙受けに導いて給排紙手段により排紙し、給排紙手段を逆転させることにより排紙受けの用紙を第一の反転経路に戻し、さらに、搬送方向切替板により第二の反転通路に導いて再度用紙搬送通路の上流側に供給することにより、印字部で用紙の反対側の面に印字することができ、そして、再び給排紙手段を正転させることにより、両面印字された用紙を搬送方向切替手段で案内しながら第一の反転通路を介して排紙受けに排紙することができる。また、排紙受けは本体の上面を利用して形成され、しかも、両面印字に際してはその排紙受けをスイッチバック通路として利用することができるため、本体の設置スペースを小さくすることができ、さらに、用紙の搬送経路を少なくすることができ、これに伴い、用紙を搬送するローラ類や搬送方向切替板の数を少なくしてコストダウンを図ることができる。

【0008】

【実施例】本発明の第一の実施例を図1及び図2に基づいて説明する。図4ないし図7において説明した部分と同一構造の部分は同一符号を用いて説明する。1は印字装置の本体で、この本体1には印字部2が内蔵され、本体1の上面には排紙受け3が形成され、本体1の側面には給紙部である給紙カセット4が着脱自在に装着されている。さらに、本体1には給紙カセット4の先端に端を発して前記印字部2を通過する用紙搬送通路5と、この

用紙搬送通路5の下流側から前記排紙受け3に向けて上方に湾曲された第一の反転通路6と、この第一の反転通路6の途中から下方に向けて接線方向に分岐され前記印字部2の下を通り上方に向けて湾曲され前記用紙搬送通路5の上流側に合流された第二の反転通路7とが設けられている。そして、第一の反転通路6と第二の反転通路7との分岐路には、下端に錘8を有する搬送方向切替板9が支軸10を中心に回転自在に設けられている。さらに、前記用紙搬送通路5にはそれぞれ用紙搬送手段である給紙ローラ11と用紙搬送ローラ12とが設けられ、前記第二の反転通路7には用紙搬送手段である用紙搬送ローラ12が設けられ、前記第一の反転通路6における前記排紙受け3と前記搬送方向切替板9との間には給排紙手段である給排紙ローラ13が設けられている。前記給紙ローラ11は一方方向に回転するモータ（図示せず）にクラッチ（図示せず）を介して連結され、このクラッチの動作により一回転して静止するものである。前記用紙搬送ローラ12は前述したモータ駆動されて一方方向に回転するものである。また、前記給排紙ローラ13は正逆回転自在のモータ（図示せず）に連結されているものである。さらに、前記第一の反転通路6における前記搬送方向切替板9と前記給排紙ローラ13との間には用紙を光学的に検出するセンサ14が設けられている。

【0009】このような構成において、給紙カセット4内の用紙は給紙ローラ11により用紙搬送通路5に送り出され、さらに、用紙搬送ローラ12により第一の反転通路6に送られる過程で印字部2により印字される。搬送方向切替板9は通常錘8の重力で垂直な姿勢に維持され、この状態では図2（a）に示すように、第一の反転通路6の中間部が搬送方向切替板9により閉塞されるが、図2（b）に示すように、搬送方向切替板9は用紙15の先端から受ける圧力により反時計方向に回転して用紙15の通過を許容する。これにより、印字された用紙15は本体1の上面の排紙受け3に導かれる。

【0010】用紙15の反対側の面に印字するためには、図2（c）に示すように、片面印字がなされた用紙15が排紙受け3に導かれ、その用紙15の後端がセンサ14により検出された時に、センサ14の検出信号によりモータを反転させ給排紙ローラ13を逆転させる。これにより、排紙受け3の用紙15は第一の反転経路6に戻され、図2（d）に示すように、錘8の重力で復帰した搬送方向切替板9により第二の反転通路7に導かれる。この時、用紙15の通過をセンサ14が検出すると、その検出信号により給排紙ローラ13を駆動するモータが停止される。これが図2（e）に示す状態である。続いて、用紙15が第二の反転通路7に設けられた用紙搬送ローラ12により再度用紙搬送通路5の上流側に供給され、この用紙搬送通路5に設けられた用紙搬送ローラ12により印字部2に供給されて印字される。そして、再び給排紙ローラ13を正転させることにより、

両面印字された用紙15は搬送方向切替板9で案内されながら第一の反転通路6を介して排紙受け3に排紙される。これが図2(f)に示す状態である。

【0011】このように、排紙受け3は本体1の上面を利用して形成され、しかも、両面印字に際してはその排紙受け3をスイッチバック通路として利用することができるため、本体1の設置スペースを小さくすることができ、さらに、用紙15の搬送経路を少なくすることができ、これに伴い、用紙15を搬送するローラ類や搬送方向切替板9の数を少なくすることができる。さらに、搬送方向切替板9を用紙15の圧力で回動させるとともに鍾8の重量で復帰させることができるため、排紙方向切替板9を駆動する動力源を省略することができる。したがって、より効果的にコストダウンを図ることができる。さらに、両面印字のために用紙を反転させてストックする中間トレイを本体1の底部に設ける必要もないので、その中間トレイを清掃する煩わしさを解消することもできる。

【0012】次いで、本発明の第二の実施例を図3に基づいて説明する。本発明は、本体1ま底部に給紙カセット4を装着し、この用紙搬送通路5のを給紙カセット4の先端部に向けて湾曲させたものである。他の構造及び作用は前記第一の実施例と同様につき省略する。

【0013】

【発明の効果】本発明は、印字部が内蔵され上面に排紙受けが形成された本体と、給紙部に接続されて前記印字部を通過する用紙搬送通路と、この用紙搬送通路の下流側から前記排紙受けに向けて上方に湾曲された第一の反転通路と、この第一の反転通路の途中から下方に向けて接線方向に分岐され前記印字部の下を通り上方に向けて湾曲され前記用紙搬送通路の上流側に合流された第二の反転通路と、前記第一の反転通路と前記第二の反転通路との分岐路に回動自在に設けられた搬送方向切替板と、前記用紙搬送通路及び前記第二の反転通路に配設された用紙搬送手段と、前記第一の反転通路における前記排紙受けと前記搬送方向切替板との間に設けられた正逆回動自在の給排紙手段とにより構成したので、給紙部から用紙搬送通路を介して印字部に用紙を供給し、印字された*

*用紙を第一の反転通路に通して搬送方向切替板により本体の上面の排紙受けに導いて給排紙手段により排紙し、給排紙手段を逆転させることにより排紙受けの用紙を第一の反転経路に戻し、さらに、搬送方向切替板により第二の反転通路に導いて再度用紙搬送通路の上流側に供給することにより、印字部で用紙の反対側の面に印字することができ、そして、再び給排紙手段を正転させることにより、両面印字された用紙を搬送方向切替手段で案内しながら第一の反転通路を介して排紙受けに排紙することができ、また、排紙受けは本体の上面を利用して形成され、しかも、両面印字に際してはその排紙受けをスイッチバック通路として利用することができるため、本体の設置スペースを小さくすることができ、さらに、用紙の搬送経路を少なくすることができ、これに伴い、用紙を搬送するローラ類や搬送方向切替板の数を少なくしてコストダウンを図ることができる等の効果を有する。

【図面の簡単な説明】

【図1】本発明の第一の実施例を示す正面図である。

【図2】経時的に用紙の反転動作を示す一部の正面図である。

【図3】本発明の第二の実施例を示す正面図である。

【図4】従来例を示す正面図である。

【図5】従来の他の例における排紙状態を示す正面図である。

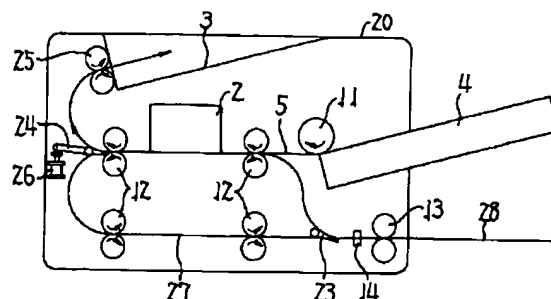
【図6】印字された用紙の両面印字状態を示す正面図である。

【図7】従来の第三の例を示す正面図である。

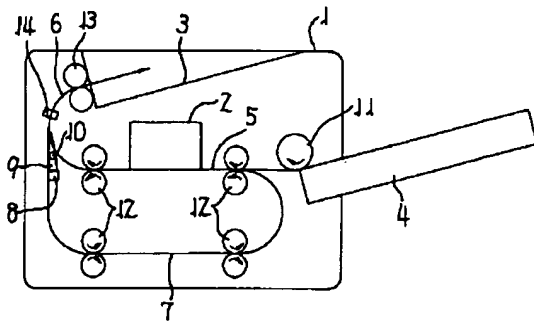
【符号の説明】

1	本体
2	印字部
3	排紙受け
4	給紙部
5	用紙搬送通路
6	第一の反転通路
7	第二の反転通路
9	搬送方向切替板
11、12	用紙搬送手段
13	給排紙手段

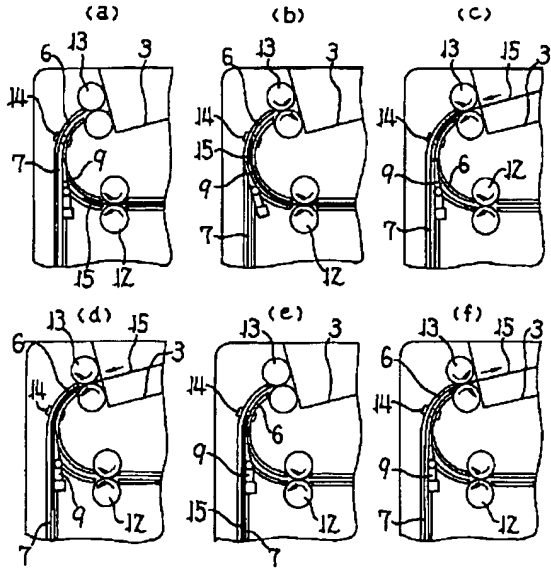
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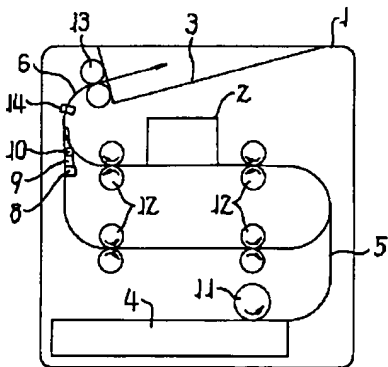
【図1】



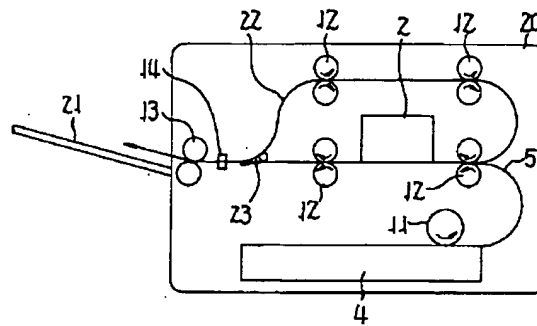
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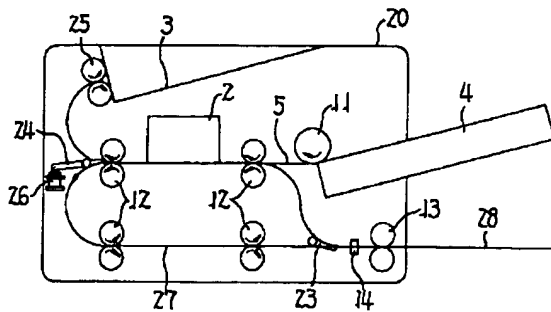
【図3】



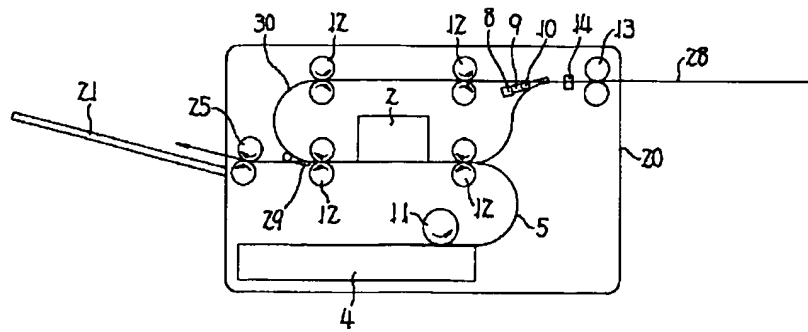
【図4】



【図6】



【図7】



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(54) [Title of the Invention] TWO-SIDED PRINTING APPARATUS

(57) [Abstract]

[Object] To provide a two-sided printing apparatus, whereby the space required for setting thereof is reduced, and the number of conveyance paths for paper sheets is reduced, so that the number of rollers for conveying paper sheets and that of conveyance direction changing plates can be decreased.

[Construction] A paper sheet after one-sided printing is discharged into a discharge paper receptacle 3 disposed in the upper part of the body 1, via a first reverse path 6. By reversing the rotation of a paper feeding discharging means 13, a paper sheet in the discharge paper receptacle 3 is returned to the first reverse path 6, and is guided to a second reverse path 7 via a conveyance direction changing

plate 9 to be supplied to the upstream side of a paper conveyance path 5 again. Then, printing is carried out on the opposite side of the paper sheet, and by rotating the paper feeding discharging means 13 in the forward direction, the paper sheet after two-sided printing is discharged into the discharge paper receptacle 3 via the first reverse path 6. The discharge paper receptacle 3 formed by utilization of the upper face of the body 1 is used as a switch back path.

[Claim]

[Claim 1] A two-sided printing apparatus comprising a body in which a printing unit is contained, and a discharge paper receptacle is formed on the upper face thereof, a paper conveyance path connected to a paper feeding portion and passing the printing unit, a first reverse path extending from the downstream side of the paper conveyance path and being bent upwardly in the direction to the discharge paper receptacle, a second reverse path branching from the mid-stream of the first reverse path in the tangential direction, passing under the printing unit, and being bent upwardly to be incorporated into the upstream side of the first conveyance path, a conveyance direction changing plate rotatably disposed in the branching path of the first reverse path and the second reverse path, a paper conveyance means disposed in the paper conveyance path and in the second reverse path, and a paper feeding discharging means rotatable in the forward and reverse directions and provided in the first reverse path between the discharge paper receptacle and the conveyance direction changing plate.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention relates to a two-sided printing apparatus.

[0002]

[Description of the Related Art] Conventionally, a two-sided printing apparatus shown in Fig. 4 has been known. That is, a paper sheet placed in a paper cassette 4 disposed in the bottom part of the body 20 of a printing apparatus is fed onto a paper-sheet conveyance path 5 by means of a paper feeding roller 11. The paper sheet is supplied to a printing unit 2 by means of sheet conveyance rollers 12. The paper sheet, after one-sided printing, is moved toward a paper discharge tray 21 disposed on a side of the body 20 by means of sheet conveyance rollers 12 to be discharged therein. Subsequently, when a sensor 14 detects the rear end of the paper sheet moving from the printing unit 2 toward the sheet-discharge tray 21, the rotation of sheet feeding discharging rollers 13 is reversed. The paper sheet is guided to the upper stream side of the sheet conveyance path 5, via a conveyance direction changing plate 22 and a reverse path 22 extending over the printing unit 2. Thus, the paper sheet is supplied to the printing unit 2 by means of sheet conveyance rollers 12 again. The paper-sheet after printing is conveyed toward the paper-discharge tray 21. The conveyance direction changing plate 23 is maintained in such a state as to close the paper conveyance path 5 due to its own weight, and thereby, the plate 23 can guide the paper sheet in the direction from the paper-discharge tray 21 to the reverse path 22. The conveyance direction

changing plate 23 is rotated upwardly to open, when the pressure of a paper sheet moving from the printing unit 2 toward the paper-discharge tray 21 is applied.

[0003] Other conventional examples will be described with reference to Figs. 5 to 7. Parts having the same structures as the parts explained with reference to Fig. 4 will be described using the same reference numerals. Referring to the examples of Figs. 5 and 6, in the case of a two-sided printing apparatus shown in Fig. 5, a paper sheet in a paper cassette 4 attached to the side face of the body 20 of the printing apparatus is fed onto the paper conveyance path 5 by means of the paper feeding roller 11. The paper sheet is supplied to the printing unit 2 by means of the paper conveyance rollers 12. The paper sheet, after one-sided printing, is guided to a discharged paper receptacle 3 formed on the upper face of the body 20 by means of a conveyance direction changing plate 24 and discharged in the receptacle by means of paper discharge rollers 25. For two-sided printing, the conveyance direction changing plate 24 is rotated by means of a solenoid 26, as shown in Fig. 6. The paper sheet conveyed from the printing unit 2 is guided to a reverse path 27, which is bent downwardly, by means of the conveyance direction changing plate 24. The paper sheet guided to the reverse path 27 is further guided to a switch-back path 28 by means of paper conveyance rollers 12 and

paper feeding discharging rollers 13. When the sensor 14 detects the rear end of the paper sheet, the paper feeding discharging rollers 13 are rotated in the reverse direction, and thereby, the paper sheet is guided to the upstream side of the paper conveyance path 5 by means of a conveyance direction changing plate 23. Then, printing is carried out on the back side of the paper sheet by the printing unit 2. The paper sheet, after the printing, is discharged into the paper discharge receptacle 3 disposed in the upper part, via the conveyance direction changing plate 24 rotated downwardly due to the return-operation of the solenoid. In this example, the conveyance direction changing plate 23 is rotated due to its own weight, and hence, the plate 23 is maintained in such a state as to guide a paper sheet from the switch-back path to the upstream side of the paper conveyance path 5. The conveyance direction changing plate 23 is rotated upwardly, when the pressure of a paper sheet moving from the reverse path 27 toward the switch-back path 28 is applied. Thereby, a paper sheet can pass the plate 23.

[0004] Fig. 7 shows an example of a conventional two-sided printing apparatus. In the case of one-sided printing, a paper sheet in the paper cassette 4, disposed in the bottom part of the body 20 of a printing apparatus, is fed onto the paper conveyance path 5 by means of the paper feeding roller 11. The paper sheet is supplied to the printing unit 2 by

means of the paper conveyance rollers 12. The paper sheet, after one-sided printing, is guided by means of a conveyance direction changing plate 29 to be discharged into a paper discharge tray 21 attached on a side of the body 20, by means of the paper discharge rollers 25. In the case of two-sided printing, a paper sheet, conveyed from the printing unit 2, is guided to a reverse path 30 extending over the printing unit 2, via a conveyance direction changing plate 29. The paper sheet guided to the reverse path 30 is conveyed to a switch-back path 28 by means of the paper conveyance rollers 12. When the sensor 14 detects the rear end of the paper sheet, the rotation of paper feeding discharging rollers 13 is reversed. Thus, the paper sheet is guided to the upstream side of the paper conveyance path 5 by means of a conveyance direction changing plate 9, so that the paper sheet is supplied to the printing unit 2 again, and then is conveyed toward the paper discharge tray 21. In this process, printing is carried out on the back side of the paper sheet. In this example, one 29 of the conveyance direction changing plates is driven by means of a solenoid. The other conveyance direction changing plate 9 is rotated around a shaft 10 in the anti-clockwise direction by means of a weight to come into contact with a stopper (not shown) and rest. Thereby, the conveyance direction changing plate 9 is kept in the state that it can guide a

paper sheet to the paper conveyance path 5. The conveyance direction changing plate 9 is rotated in the horizontal direction, when the pressure of a paper sheet moving from the reverse path 30 toward the switch back path 28 is applied. Thereby, the paper sheet can pass the plate 9.

[0005]

[Problems to be Solved by the Invention] Referring to the apparatus shown in Fig. 4, in the case of two-sided printing, it is necessary to provide the paper discharge tray 21 on the side face of the body 20, so that a paper sheet after printing can be returned to the reverse path 22. For this purpose, a large space for setting the body 20 is required. Similarly, as to the apparatuses shown in Figs. 5 and 6, it is necessary to provide the switch back path 28 in the side-face part of the body 20 so that a paper sheet after printing is returned to the reverse path 27. Similarly, as to the apparatus shown in Fig. 7, for the purpose of returning the paper sheet after printing to the upstream side of the paper conveyance path 5, it is necessary to provide the switch back path 28 in the side part of the body 20 and the paper discharge tray 21 in the other side part of the body 20. Thus, the space for setting the body 20 is large. Moreover, in the case where the switch back path 28 is provided separately from the discharged paper receptacle 3 and the paper discharge tray 21, as shown in Figs. 5 and 7,

the conveyance paths for paper sheets become more complicated. Thus, problematically, the numbers of rollers for conveying paper sheets and conveyance direction changing plates become larger, and the cost becomes high. There is known a printing apparatus in which for two-sided printing, an intermediate tray for storing a reversed paper sheet is provided in the body of the apparatus (not shown). This intermediate tray tends to be stained, since it stores paper sheets directly after printing. It is troublesome to clean the intermediate tray which is provided inside the body.

[0006]

[Means for Solving the Problems] The present invention comprises a body in which a printing unit is contained, and a discharge paper receptacle is formed on the upper face thereof, a paper conveyance path connected to a paper feeding portion and passing the printing unit, a first reverse path extending from the downstream side of the paper conveyance path and being bent upwardly in the direction to the discharge paper receptacle, a second reverse path branching from the mid-stream of the first reverse path in the tangential direction, passing under the printing unit, and being bent upwardly to be incorporated into the upstream side of the first conveyance path, a conveyance direction changing plate rotatably disposed in the branching path of the first reverse path and the second reverse path, a paper

conveyance means disposed in the paper conveyance path and in the second reverse path, and a paper feeding discharging means rotatable in the forward and reverse directions and provided in the first reverse path between the discharge paper receptacle and the conveyance direction changing plate.

[0007]

[Operations] A paper sheet is fed from the paper feeding portion to the printing unit via the paper conveyance path. The paper sheet after printing is conveyed in the first reverse path to be guided to the paper feeding discharging receptacle on the upper face of the body by means of the conveyance direction changing plate and be discharged therein by means of the paper feeding discharging means. By reversing the rotation of the paper feeding discharging means, the paper sheet in the discharge paper receptacle is returned to the first reverse path, and is guided to the second reverse path by means of the conveyance direction changing plate. Then, the paper sheet is supplied to the upstream side of the paper conveyance path again. Thereby, printing can be carried out on the opposite side of the paper sheet by means of the printing unit. Then, by rotating the paper feeding discharging means in the forward direction again, the paper sheet can be discharged into the discharge paper receptacle via the first reverse path while it is guided by means of the conveyance direction changing

plate. Moreover, the discharge paper receptacle is formed by utilization of the upper face of the body, and moreover, the discharge paper receptacle can be used as a switch back path. Thus, the space where the body is to be set can be reduced. Moreover, the number of conveyance paths for paper sheets can be reduced. Thereby, the number of rollers for conveying paper sheets and that of conveyance direction changing plates can be decreased.

[0008]

[Embodiment] A first embodiment of the present invention will be described with reference to Figs. 1 and 2. Parts having the same structures of the parts described with reference to Figs. 4 to 7 will be designated by the same reference numerals to be explained. Reference numeral 1 designates the body of a printing apparatus. A printing unit 2 is contained in the body 1. A discharge paper receptacle 3 is formed on the upper face of the body 1. A paper feeding cassette 4 for feeding a paper sheet is detachably mounted onto a side face of the body 1. Moreover, a paper conveyance path 5 starting from the front end of the paper feeding cassette 4 and extending so as to pass the printing unit 2, a first reverse path 6 starting from the downstream side of the paper conveyance path 5 and extending so as to be upwardly bent toward the discharge paper receptacle 3, and a second reverse path 7 branching from the

mid-stream of the first reverse path 5 in the tangential direction to extend downwardly, pass under the printing unit 6, be upwardly bent, and be incorporated into the upstream of the paper conveyance path 5 are provided in the body 1. A conveyance direction changing plate 9 having a weight at the lower end thereof is provided rotatably around a shaft 10 in the branching path of the first reverse path 6 and the second reverse path 7. Moreover, a paper feeding roller 11 and paper conveyance rollers 12, which are means for conveying paper sheets, respectively, are provided in the paper conveyance path 5. Paper conveyance rollers 12, which are means for conveying paper sheets, are provided in the second reverse path 7. Paper feeding discharging rollers 13, which are means for feeding and discharging paper sheets, are provided in the first reverse path 6 between the discharge paper receptacle 3 and the conveyance direction changing plate 9. The paper feeding roller 11 is connected to a motor (not shown) rotatable in one direction via a clutch (not shown). The roller 11 is rotated by 360 degrees and rests. The paper conveyance rollers 12 are driven by means of the motor in one direction. The paper feeding discharging rollers 13 are connected to a motor (not shown) rotatable in the forward and reverse directions. Moreover, a sensor 14 for optically detecting a paper sheet is provided in the first reverse path 6 between the conveyance

direction changing plate 9 and the paper feeding discharging roller 13.

[0009] In the above-described configuration, a paper sheet in the paper feeding cassette 4 is fed onto the paper conveyance path 5 by means of the paper feeding roller 11. Printing is carried out on the paper sheet by the printing unit 2 in the process in which the paper sheet is conveyed to the first reverse path 6 by means of the paper conveyance rollers 12. The conveyance direction changing plate 9 is ordinarily maintained in the state in which the plate 9 stands upright due to the gravity force of the weight 8. In this state, the intermediate portion of the first reverse path 6 is closed by the conveyance direction changing plate 9 as shown in Fig. 2(a). However, as shown in Fig. 2(b), the conveyance direction changing plate 9 is rotated in the anticlockwise direction due to the pressure applied by the front end of the paper sheet 15, so that the paper sheet 15 can pass the conveyance direction changing plate 9. Thereby, the paper sheet 15 after printing is guided to the discharge paper receptacle 3 on the upper face of the body 1.

[0010] To print on the opposite side of the paper sheet 15, the paper sheet 15 after one-sided printing is guided to the discharge paper receptacle 3; and when the rear end of the paper sheet 15 is detected by the sensor 14, the detection signal of the sensor 14 causes the motor to rotate in the

reverse direction so that the rotation of the paper feeding discharging roller 13 is reversed, as seen in Fig. 2(c). Thereby, the paper sheet 15 in the discharge paper receptacle 3 is returned to the first reverse path 6. As shown in Fig. 2(d), the paper sheet 15 is guided to the second reverse path 7 by means of the conveyance direction changing plate 9 restored due to the gravity force of the weight 8. When the sensor 14 detects the passage of the paper sheet 15, the detection signal causes the motor to stop, the motor driving the paper feeding discharging roller 13. This state is shown in Fig. 2(e). Subsequently, the paper sheet 15 is supplied to the upstream side of the paper conveyance path 5 again by means of the paper conveyance rollers 12 provided in the second reverse path 7. The paper sheet is supplied to the printing unit 2 by means of the paper conveyance rollers 12 provided in the paper conveyance path 5, where printing is carried out. Then, the paper feeding discharging roller 13 is rotated in the forward direction again. Thereby, the paper sheet 15 after both-sided printing is guided by the conveyance direction changing plate 9, and is discharged in the discharge paper receptacle 3 via the first reverse path 6. Fig. 2(f) shows this state.

[0011] As described above, the discharge paper receptacle 3 is formed utilizing the upper face of the body 1, and for

two-sided printing, the discharge paper receptacle 3 is used as a switch back path. Therefore, the space where the body 1 is to be set can be reduced. In addition, the conveyance paths for paper sheets 15 can be reduced. Further, in addition, the number of the rollers for conveying paper sheets 15 and that of the conveyance direction plates can be reduced. Moreover, the conveyance direction changing plate 9 can be rotated by use of the pressure of a paper sheet 15, and the position thereof can be restored by the weight of the weight 8. Therefore, a power source for driving the conveyance direction changing plate 9 can be omitted. Thus, the cost reduction can be effectively realized. Furthermore, for two-sided printing, it is not necessary to provide the intermediate tray to store a reversed paper sheet in the bottom part of the body 1. Troubles with which the intermediate tray is cleaned can be eliminated.

[0012] Hereinafter, a second embodiment of the present invention will be described with reference to Fig. 3. According to this invention, a paper feeding cassette 4 is disposed in the bottom part of the body 1. A paper conveyance path 5 is bent in the direction to the front end of the paper feeding cassette 4. The other structure and the operations are the same as those of the first embodiment. Thus, the description is omitted.

[0013]

[Advantages] The present invention comprises a body in which a printing unit is contained, and a discharge paper receptacle is formed on the upper face thereof, a paper conveyance path connected to a paper feeding portion and passing the printing unit, a first reverse path extending from the downstream side of the paper conveyance path and being bent upwardly in the direction to the discharge paper receptacle, a second reverse path branching from the mid-stream of the first reverse path in the tangential direction, passing under the printing unit, and being bent upwardly to be incorporated into the upstream side of the first conveyance path, a conveyance direction changing plate rotatably disposed in the branching path of the first reverse path and the second reverse path, a paper conveyance means disposed in the paper conveyance path and in the second reverse path, and a paper feeding discharging means rotatable in the forward and reverse directions and provided in the first reverse path between the discharge paper receptacle and the conveyance direction changing plate. Accordingly, a paper sheet is fed from the paper feeding portion to the printing unit via the paper conveyance path. The paper sheet after printing is conveyed in the first reverse path to be guided to the paper feeding discharging receptacle disposed on the upper face of the body by means of the conveyance direction changing plate and be discharged

therein by means of paper feeding discharging means. By reversing the rotation of the paper feeding discharging means, the paper sheet in the discharge paper receptacle is returned to the first reverse path, and is guided to the second reverse path by means of the conveyance direction changing plate. Then, the paper sheet is supplied to the upstream side of the paper conveyance path again. Thereby, printing can be carried out on the opposite side of the paper sheet by means of the printing unit. Then, by rotating the paper feeding discharging means in the forward direction again, the paper sheet is discharged into the discharge paper receptacle via the first reverse path while the sheet is guided by means of the conveyance direction changing plate. The discharge paper receptacle is formed by utilization of the upper face of the body, and moreover, the discharge paper receptacle can be used as a switch back path. Thus, the space where the body is to be set can be reduced. Moreover, the number of conveyance paths for paper sheets can be reduced. Thereby, the number of rollers for conveying paper sheets and that of conveyance direction changing plates can be decreased. Accordingly, the cost reduction can be realized.

[Brief Description of the Invention]

[Fig. 1] Fig. 1 is a front view of a first embodiment of the present invention.

[Fig. 2] Fig. 2 is a partial front view showing the reverse operation of a paper sheet with time.

[Fig. 3] Fig. 3 is a front view of a second embodiment of the present invention.

[Fig. 4] Fig. 4 is a front view of a conventional example.

[Fig. 5] Fig. 5 is a front view showing the paper discharge state of another conventional example.

[Fig. 6] Fig. 6 is a front view showing the two-sided printing of a paper sheet after printing.

[Fig. 7] Fig. 7 is a front view of a third conventional example.

[Reference Numerals]

1; body

2; printing unit

3; discharge paper receptacle

4; paper feeding portion

5; paper conveyance path

6; first reverse path

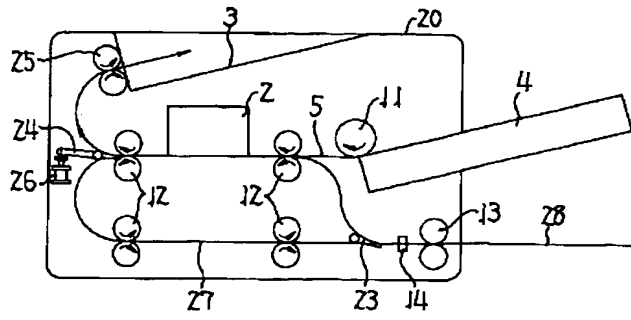
7; second reverse path

9; conveyance direction changing plate

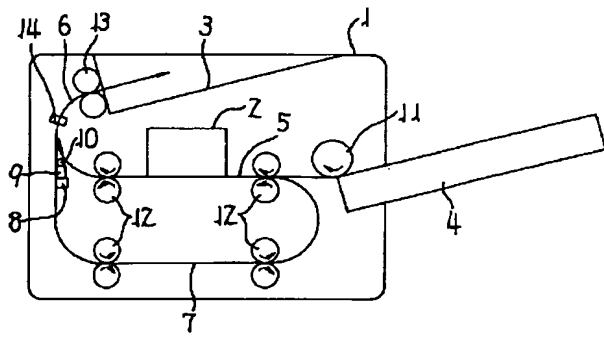
11, 12; paper conveyance means

13; paper feeding discharging means

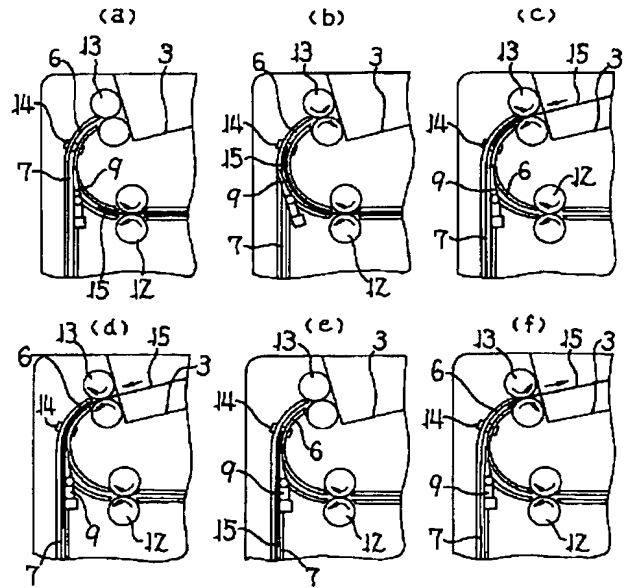
【図 5】 [FIG. 5]



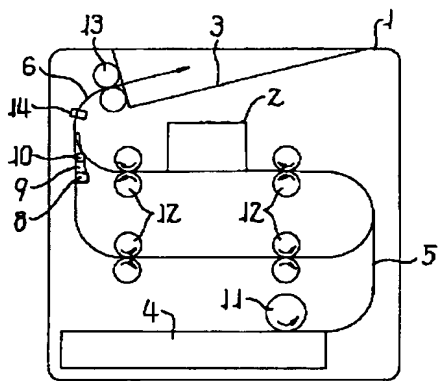
【図1】 [FIG. 1]



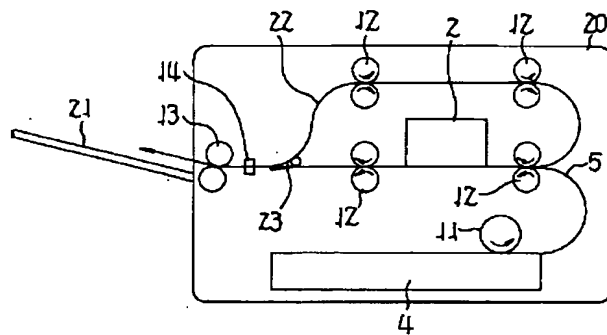
【図2】 [FIG. 2]



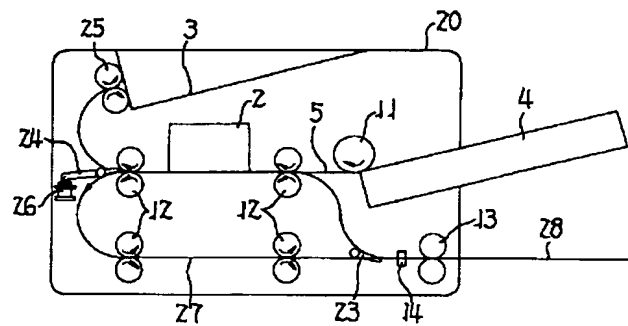
【図3】 [FIG. 3]



【図4】 [FIG. 4]



【図6】 [FIG. 6]



【図 7】 [FIG. 7]

